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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/964,910	09/27/2001	Kiyoshi Yamaura	112857-301	3249

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16

EXAMINER

YUAN, DAH WEI D

ART UNIT	PAPER NUMBER
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1745

DATE MAILED: 08/27/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/964,910

Applicant(s)

YAMAURA ET AL.

Examiner

Dah-Wei D. Yuan

Art Unit

1745

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 8-32 is/are pending in the application.
- 4a) Of the above claim(s) 27-32 is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 8-26 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 5.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

Art Unit: 1745

FUEL CELL AND METHOD FOR PREPARATION THEREOF

Examiner: Yuan

S.N. 09/964,910

Art Unit: 1745

August 21, 2003

Election/Restrictions

1. Applicant's election without traverse of Group I, claims 8-26, in Paper No. 7 is acknowledged. Claims 27-32 are withdrawn from consideration.

Specification

2. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claims 8,10,14,16-18,20,21,26 are rejected under 35 U.S.C. 102(e) as being anticipated by Fleckner et al. (US 6,589,682 B1) as evidenced by Oyama et al. (US 2003/0048057 A1).

With respect to claims 8,10, Fleckner et al. teach a fuel cell comprising two gas diffusion layers (100,102) (gas diffusion electrode), which comprises carbon nanotubes to distribute

Art Unit: 1745

reactant gas over the catalyst sites. See Column 7, Lines 8-36; Figures 6-8. The carbon nanotube is a fibrous carbon material as evidenced by Oyama et al. See Paragraph 4.

With respect to claims 14,16, Fleckner et al. teach a fuel cell comprising a Nafion membrane (92) (a perfluorosulfonate ionomer) disposed between two gas diffusion electrodes (100,102). The gas diffusion electrodes further comprise carbon nanotubes. See Column 7, Lines 8-36; Figures 6-8.

With respect to claims 17,18, Fleckner et al. teach the fuel cell further comprising a Pt/carbon ink by mixing 20 wt.% platinum on Vulcan XC-72R carbon with Nafion solution. See Column 8, Lines 39-58.

With respect to claim 20, the fuel is supplied through conduits (41) to the gas diffusion electrode (56) on the fuel side of the fuel cell whereas oxygen is supplied through conduits (43) to the gas diffusion electrode (54) on the oxidant side of the fuel cell. See Figure 2, Column 5, Lines 40-67.

With respect to claim 21, Fleckner et al. teach a fuel cell comprising a Nafion membrane (92) (a perfluorosulfonate ionomer) and two gas diffusion electrodes (100,102). The gas diffusion electrodes further comprise carbon nanotubes. See Column 7, Lines 8-36; Figures 6-8.

With respect to claim 26, Fleckner et al. teach the fuel cell further comprising a Pt/carbon ink by mixing 20 wt.% platinum on Vulcan XC-72R carbon with Nafion solution. See Column 8, Lines 39-58.

Art Unit: 1745

5. Claims 8,11,14,16,21,23 are rejected under 35 U.S.C. 102(e) as being anticipated by Hager et al. (US 6,013,371) as evidenced by Kordesch et al. (Fuel Cells and Their Applications, VCH Publishers, Inc.)

With respect to claims 8,11, Hager et al. teach the use of vapor grown carbon fiber (VGCF) to fabricate separators and electrodes (gas diffusion electrodes) in a fuel cell. See Column 3, Line 62 to Column 4, Line 5; Column 9, Line 56 to Column 10, Line 6; Column 12, Lines 11-16.

With respect to claims 14,16,21,23, Hager et al. teach the electrodes in a fuel cell can be made of vapor grown carbon fiber (VGCF) material. The VGCF material from Applied Sciences, Inc of Cedarville, OH is a discontinuous highly graphitic fiber with an unique annular morphology. The fuel cell inherently comprises proton conducting material (electrolyte) sandwiched between an anode and a cathode as evidenced by Kordesch et al. See pages 51-53. A reference which is silent about a claimed invention's features is inherently anticipatory if the missing feature is necessarily present in that which is described in the reference. In re Robertson, 49 USPQ2d 1949 (1999).

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person

Art Unit: 1745

having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 12,13,19,22,24,25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fleckner et al. (US6,589,682 B1) and Oyama et al. (2003/0048057 A1) as applied to claims 8,10,14,16-18,20,21,26 above, and further in view of Hager et al. (6,013,371).

With respect to claim 12, Fleckner et al. disclose gas diffusion electrodes comprising carbon nanotube material as described above in Paragraph 4. However, Fleckner et al. do not teach the fibrous carbonaceous material comprising a mixture of carbon nanotubes and vapor grown carbon fibers. Hager et al. teach the addition of vapor grown carbon fibers can enhance the mechanical performance of the resulting carbon-carbon composite. See Column 3, Line 62 to Column 4, Line 5. Therefore, it would have been obvious to one of ordinary skill in the art to use of the mixture of carbon nanotube and vapor grown carbon fibers on the gas diffusion electrode of Fleckner et al., because Hager et al. teach the addition of VGCF can improve mechanical performance of the components.

With respect to claim 22, Fleckner et al. disclose a fuel cell comprising a proton conductor disposed between a first electrode and a second electrode wherein both electrodes comprise a carbon nanotube material as described above in paragraph 4. However, Fleckner et al. do not teach the fibrous carbonaceous material comprising a mixture of carbon nanotubes and vapor grown carbon fibers. Hager et al. teach the addition of vapor grown carbon fibers can enhance the mechanical performance of resulting carbon-carbon composite. See Column 3, Line 62 to Column 4, Line 5. Therefore, it would have been obvious to one of ordinary skill in the art to use of the mixture of carbon nanotube and vapor grown carbon fibers on the gas diffusion

electrode of Fleckner et al., because Hager et al. teach the addition of VGCF can improve mechanical performance of the components.

With respect to claims 13,19,24,25, Fleckner et al. and Hager et al. disclose applicant's invention essentially as claimed, with the exception that the ratio between the carbon nanotube and the vapor grown carbon fibers in the mixture is not discussed. However, Hager et al. recognize the incorporation of vapor grown carbon fibers into the composite can provide a reinforcing effect on the mechanical property of the material. See Column 3, Lines 8-12; Column 3, Line 62 to Column 4, Line 5. Therefore, it would have been within the skill of the ordinary artisan to adjust the relative amounts of carbon nanotube and vapor grown carbon fiber in the composite depending on the strength requirement of the composite electrode in the fuel cell. *Discovery of optimum value of result effective variable in known process is ordinarily within skill of art.* In re Boesch, CCPA 1980, 617 F.2d 272, 205 USPQ215.

8. Claims 9,15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fleckner et al. (US 6,589,682 B1) and Oyama et al. (2003/0048057 A1) as applied to claims 8,10,14,16-18,20,21,26 above.

The disclosure of Fleckner et al. and Oyama et al. differs from Applicant's claims in that Fleckner et al. and Oyama et al. do not specifically discuss the thickness of the electrode in the fuel cell. However, Fleckner et al. recognize a large number of ohmically contacted nanotube devices of controllable length can be fabricated by a combination of synthesis and microfabrication techniques. See Column 9, Lines 32-46. Therefore, it would have been within

Art Unit: 1745

the skill of the ordinary artisan to adjust the synthesis and microfabrication techniques to obtain a electrode comprising carbon nanotube with a thickness of about 5 μm or less. *Discovery of optimum value of result effective variable in known process is ordinarily within skill of art.* In re Boesch, CCPA 1980, 617 F.2d 272, 205 USPQ215.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dah-Wei D. Yuan whose telephone number is (703) 308-0766. The examiner can normally be reached on Monday-Friday (8:00-5:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick J. Ryan, can be reached on (703) 308-2383. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

Dah-Wei D. Yuan
August 25, 2003

